Single- Molecule Mass Spectrometry

high- resolution biomarker detection for health- care researchers

A non- destructive technique that in principle can measure one molecule (DNA, toxins, biomarkers) at a time in a space small enough to fit onto a single microchip device.

Annual Sales Forecast for USA *				Innovation Status		Idea
Sales & Marketing Support Level	Conservative 80% odds of selling	Most Likely 50% odds of selling	Aggressive 20% odds of selling	Development Status	Proprietary Protection Status	Concept Score
Ultra Low	$4	$280,000	$4.0 M	1 of 5 In Development	2 of 5 Patent Pending	36
Low Support	$3.2 M	$15.5 M	$54.3 M			29 is Average
Medium Support	$27.7 M	$121.0 M	$365.7 M			
High Support	$72.3 M	$323.4 M	$982.5 M	Remaining Time & Cost to First Sale		
Ultra High	$137.3 M	$605.5 M	$1.8 B	3-5 yrs	$1M-$10M	

Single- Molecule Mass Spectrometry - *high- resolution biomarker detection for health- care researchers*

Final Decision Maker: *biotechnology research firms, chemical analysis labs, forensics labs, health- care labs, preventive medicine labs, systems biology labs*

Imagine being able to rapidly identify tiny biological molecules such as DNA and toxins (e.g., anthrax) using less than a drop of salt water in a system that can fit on a microchip. Researchers have shown that a single nanometer- scale pore can be used to accurately detect and sort different- sized polymer molecules (a model for biomolecules) that pass through the pore. Traditionally, unknown molecules are measured and identified using mass spectrometry, a process that involves ionizing a large number of target molecules, then analyzing the masses of the resulting molecules to produce a "molecular fingerprint" for the original sample. This equipment can cover a desk. By contrast, the new system is non- destructive, measures one molecule at a time, and can fit in a space as small as a microchip.

The technique involves creating a lipid bilayer membrane similar to those in living cells, and "drilling" a pore in it with a bacterial protein toxin (alpha- hemolysin) designed specifically to penetrate cell membranes. Charged molecules (such as single- stranded DNA) are forced one- by- one into the nanopore, which is 1.5 nm at its narrowest, by an applied voltage. As the molecules pass through the channel, the ionic current flow is reduced in proportion to the size of each individual chain, allowing its size or mass to be easily derived. In one experiment, various- sized polymer chains in solution of the uncharged polymer polyethylene glycol (PEG) were substituted for biomolecules. Each size of PEG molecule reduced the nanopore's electrical conductance differently: larger polymers reduce the current more than do smaller ones. The system is capable of easily discriminating between PEGs whose sizes differ by less than 0.3 nm.

As a control, a solution of a highly- purified PEG of a specific size was characterized with the nanopore. The resulting "fingerprint" closely matched the one identifying samples of the same size polymer in the mixed polymer solution.Further enhancement of the data from the tests yielded mass measurements and identifications of the different PEG sizes that correlate with traditional mass spectrometry.

Because of the nanoscale dimensions involved, the "single- molecule mass spectrometry" technology may one day be incorporated into "lab- on- a- chip" molecular analyzers and single- strand DNA sequencers.

$500,000 for mass spectrometry instrument

Seeking: *Purchase, Investment, Manufacturing/ R&D*

Email Inventor(s) | Link to Website With More Info | Link to YouTube Video | Inventor(s) Open to Consulting Requests | Agree to use Fair Contract | Invention can be exported

* Consumption sales forecast. Does not include "Random" events or "Inventory Fill". Forecast is for Year 1 for Large or Year 2 for Small Companies. Forecast should be read as ..."With Low marketing support there is an 80% odds of achieving sales of at least...

Report Assumptions and Inventor(s) Commentary

Inventor(s) Assumptions	"Most Likely" Estimate	Confidence	Inventor(s) Commentary Data Source or Basis for Assumptions
# of Possible Final Decision Makers	3,000	20%	Total pharmaceutical manufacturers = 1131 Total basic chemical manufacturers = 971 Total chemical products manufacturers = 3000
Revenue per First Purchase	$30,000.00	30%	The electronics and computer = $17,000 The nanopore = $3,000
% that will Repeat	80%	30%	The nanopore will be disposable (akin to modern razor), because it may become fouled or the end- user may need to detect and characterize a different class of compounds.
Number of Annual Repeats	1000	30%	P4 medicine requires quantifying approximately 2,000 proteins simultaneously/ sample. This may require weekly replacement of 500 nanoscale detectors.
Revenue per Repeat Purchase	$3,000.00	30%	Because the detector will be tuned to detect specific classes of molecules, an end- user will need to buy different detectors for different compounds. Also, the detectors may foul.
Reseller (Trade) Margin	N.A.	N.A.	
Producer Profit (EBITD)	50%	30%	The device will use nanoscale components (will require very little material) in a platform that is scaleable (chip- based technologies follow Moore's law).

Innovation Status			
Development Status	1 of 5 In Development		The technique has been demonstrated using a biomolecule mimic polymer: PEG. Implementation using DNA is the next step to be followed by further engineering development.
Cost to First Sale (remaining)	$1M-$10M	30%	5 scientists and engineers needed, assuming they would work in close collaboration with NIST.
Time to First Sale (remaining)	3-5 yrs	20%	Modifying the detector to characterize a wide- range of molecules is required. Also, making the detector robust will be needed.
Confidence in Concept Claims made in description		40%	Proceedings of the National Academy of Sciences 104 (20): 8207, May 15, 2007. Annual Review of Analytical Chemistry 1, 737-766
Proprietary Protection Status	2 of 5 Patent Pending		A patent application has been filed that covers the technique and associated signal processing.

Concept Score & Diagnostics

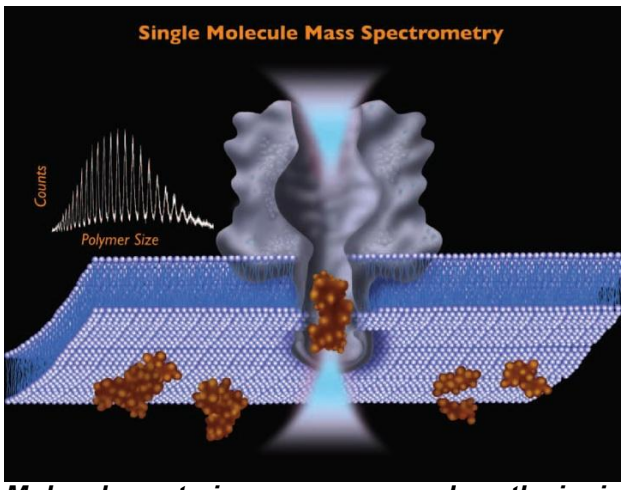
Merwyn Concept Score
With Confidence Bands

Pessimistic 80% odds of at Least	Most Likely 50% odds of at Least	Optimistic 20% odds of at Least
24%	36%	49%

Concept Diagnostics	Red	Yellow	Green
Percentile Group	Bottom 40%	Middle 40%	Top 20%
Overt Benefit			
Reason to Believe			
Dramatic Difference			

Inventor Commentary & Alternative Development Scenarios

Inventor(s) Sales Goals			
Minimum Goal	$70,000	**Current GOAL**	**$0.4 M**



Molecules entering a nanopore reduce the ionic current through the membrane in proportion to their size.

Inventor(s) Commentary:
The system may find use in the detection, characterization and quantification of a wide- range of molecules in many different industries (chemical, biotechnology, medicine, plant genomics).

CURRENT SALES FORECAST

Sales & Marketing Support Level	Conservative **80%** odds of selling	Most Likely **50%** odds of selling	Aggressive **20%** odds of selling
Ultra Low	$4	$280,000	$4.0 M
Low Support	$3.2 M	$15.5 M	$54.3 M
Medium Support	$27.7 M	$121.0 M	$365.7 M
High Support	$72.3 M	$323.4 M	$982.5 M
Ultra High	$137.3 M	$605.5 M	$1.8 B

If MARKETING CONCEPT Improved
(Increase Concept Score by +20 Points)

Sales & Marketing Support Level	Conservative **80%** odds of selling	Most Likely **50%** odds of selling	Aggressive **20%** odds of selling
Ultra Low	$7	$450,000	$6.3 M
Low Support	$5.2 M	$25.0 M	$84.9 M
Medium Support	$45.8 M	$192.7 M	$577.4 M
High Support	$120.6 M	$522.7 M	$1.6 B
Ultra High	$222.4 M	$975.2 M	$2.9 B

If PRODUCT/ SERVICE Improved
(Increase Repeat Rate & Number of Repeats by 30% and Revenue Per Purchase 20%)

Sales & Marketing Support Level	Conservative **80%** odds of selling	Most Likely **50%** odds of selling	Aggressive **20%** odds of selling
Ultra Low	$8	$590,000	$8.1 M
Low Support	$6.6 M	$31.9 M	$109.0 M
Medium Support	$58.5 M	$238.9 M	$731.3 M
High Support	$145.4 M	$642.8 M	$2.0 B
Ultra High	$282.9 M	$1.3 B	$3.7 B

If MARKETING CONCEPT and PRODUCT/ SERVICE Improved
(Increase Concept +20 Points, Repeat Rate & Number of repeats by 30% and Revenue per purchase 20%)

Sales & Marketing Support Level	Conservative **80%** odds of selling	Most Likely **50%** odds of selling	Aggressive **20%** odds of selling
Ultra Low	$13	$880,000	$13.3 M
Low Support	$10.5 M	$48.9 M	$174.8 M
Medium Support	$88.9 M	$388.5 M	$1.1 B
High Support	$233.5 M	$1.1 B	$3.2 B
Ultra High	$456.6 M	$2.0 B	$5.9 B

Additional Details

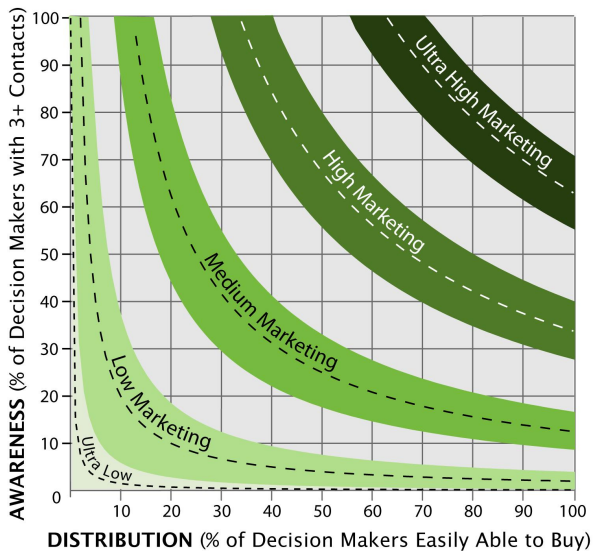
Fair Market Royalty (%)			
	Conservative - 80% Odds Royalty Percentage	**Most Likely - 50% Odds** Royalty Percentage	**Aggressive - 20% Odds** Royalty Percentage
At CURRENT State & Status	**3.2%**	**6.3%**	**10.1%**

Sales & Marketing Support Level	Annual Inventor Royalty Revenue			3 Year Value to Inventor If 50% Odds
	80% Odds	50% Odds	20% Odds	
Ultra Low Support	**$23,000**	**$72,000**	**$160,000**	**$220,000**
Low Support	**$430,000**	**$1.3 M**	**$2.7 M**	**$3.9 M**
Medium Support	**$3.3 M**	**$9.1 M**	**$19.0 M**	**$27.4 M**
High Support	**$8.6 M**	**$24.4 M**	**$51.0 M**	**$73.2 M**
Ultra High Support	**$16.5 M**	**$46.0 M**	**$94.6 M**	**$137.9 M**

Sales & Marketing Support Level Assumptions

Sales & Marketing Support Level	Sample Numbers		% Aware x % Distribution (Aware & Able)	Inventor Estimate of Odds
	% Distribution	% Awareness		
Ultra Low Support (Word of Mouth)	**5%**	**3%**	0.2%	**N/ A**
Low Support (Small Company)	**20%**	**10%**	2%	**N/ A**
Medium Support (Medium Sized Company)	**50%**	**25%**	13%	**N/ A**
High Support (Large Company)	**75%**	**45%**	34%	**N/ A**
Ultra High Support (Mega or Niche)	**90%**	**70%**	63%	**N/ A**

Graph of EQUIVALENT (Awareness x Distribution) Combinations



NAICS Industry Codes For This Invention
32518 - Other Basic Inorganic Chemical Manufacturing
32519 - Other Basic Organic Chemical Manufacturing
32541 - Pharmaceutical and Medicine Manufacturing

Patent Numbers that apply to this Product/ Service
61/050,832
10/946,802
6,824,659
11/070,398
6,015,714

Inventor(s) PEDIGREE	
Years EXPERIENCE in related industry	**20**
GRANTED Patents	**3**
Licensing Deals SIGNED	**2**
Innovations that have SHIPPED	**1**

For USA Patents: Utility Patent = 7 digit number, Design Patent starts with D, Planet Patent starts with PP. Provisional Application "61/ xxx,xxx", Non provisional application "12/ xxx,xxx", Design patent application "29/ xxx,xxx"

CAUTION: *This Merwyn Business Simulation Research Report includes no warranty or guarantee. Results and opinions should be considered rough and directional in nature. This is because the report is based upon inventor- supplied data and simplified modeling methods. If you are looking to invest, distribute, purchase or become involved with this innovation, in any way, we strongly urge you to validate the inventor data and sales forecasts BEFORE committing yourself or your resources. Merwyn Research, Inc. shall not be responsible for any liability or damages arising out of the failure to perform such investigation and validation. Changes in the concept description, product, pricing, or input assumptions will almost certainly change results.*

Additional Forecasts for Other Countries

Annual Sales - Probability Forecast - for Canada			
Sales & Marketing Support Level	**Conservative 80%** odds of selling	**Most Likely 50%** odds of selling	**Aggressive 20%** odds of selling
Ultra Low	**$0**	**$31,000**	**$440,000**
Low Support	**$350,000**	**$1.7 M**	**$6.0 M**
Medium Support	**$3.1 M**	**$13.4 M**	**$40.5 M**
High Support	**$8.0 M**	**$35.8 M**	**$108.9 M**
Ultra High	**$15.2 M**	**$67.1 M**	**$203.3 M**

Assumptions: exchange rate of $1.00 US = $1.01083 CAN; population of 33,390,141

Annual Sales - Probability Forecast - for United Kingdom			
Sales & Marketing Support Level	**Conservative 80%** odds of selling	**Most Likely 50%** odds of selling	**Aggressive 20%** odds of selling
Ultra Low	**£0**	**£28,000**	**£400,000**
Low Support	**£320,000**	**£1.6 M**	**£5.5 M**
Medium Support	**£2.8 M**	**£12.2 M**	**£36.8 M**
High Support	**£7.3 M**	**£32.5 M**	**£98.8 M**
Ultra High	**£13.8 M**	**£60.9 M**	**£184.5 M**

Assumptions: exchange rate of $1.00 US = £0.50458 UK; population of 60,776,238